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ON THE
VARIOUS METHODS OF PRINTING
PHOTOGRAPHIC PICTURES
UPON PAPER.

WITH
SUGGESTIONS FOR THEIR PRESERVATION.

BY ROBERT HOWLETT.

Tested by Practice.

LONDON:
SAMPSON LOW, SON, AND CO., 47 LUDGATE HILL;
AND AT
THE PHOTOGRAPHIC INSTITUTION, 168 NEW BOND STREET.
1856.

PREFACE.

THIS little Manual pretends to nothing more than to be a safe and intelligible guide in the various processes of Photographic Printing. These processes may be said to be common property, inasmuch as they are the fruit of much scientific investigation, and of a vast number of experiments conducted specially with a view to remedy whatever had been found faulty in practice. They have thus been gradually brought into their present comparatively perfect condition.

In describing them, I have not been unmindful of the difficulties which beset myself when first starting in the photographic course; it has been my study to give

full and precise directions such as are capable of being pursued successfully with only ordinary attention.

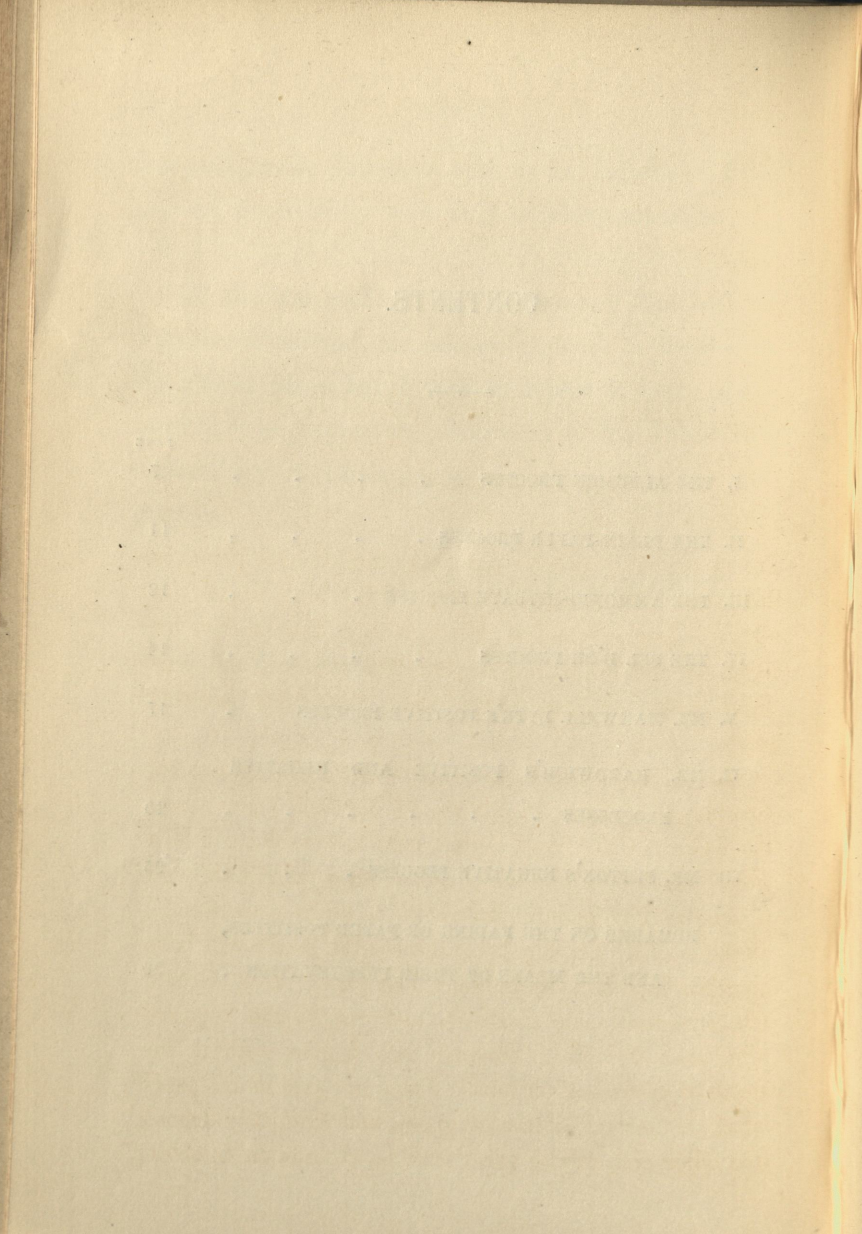
Of the use made of Mr. Sutton's "Handbook of Negative Printing," an acknowledgment is inserted in the proper place, but I wish to repeat it here; and I must likewise express my obligations to Mr. Hardwich's "Chemistry of Photography" for many valuable suggestions.

ROBERT HOWLETT.

168 *New Bond Street.*

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THE ALBUMEN PROCESS.

THE most simple process for obtaining positive prints is that upon albumenized paper. The best paper for albumenizing is Canson frères, either the positive or negative; the latter has a very fine surface, and produces more delicate prints than the thick positive paper.

To Albumenize Paper. — Dissolve 400 grains of chloride of sodium in 20 oz. of distilled water; add the whites of 20 fresh eggs; beat the mixture into a froth by means of a bunch of quills; then pour it through a piece of fine muslin placed in a large glass funnel. In the course of a few hours nearly the whole will have subsided into a clear liquid. The paper being selected (the smoothest side marked), and cut to the required size, pour the clear albumen into a glass dish to the depth of about half an inch. Place one end of the paper upon the surface of the albumen, and gradually depress the other end, taking great care to exclude air-bubbles;

allow the paper to remain on until it becomes flat (which will be in about one minute), then remove it quickly from the albumen, drain it for a minute or two, and then hang it up by *two* corners in a warm room to dry; when dry, place the sheets one upon another between two boards, and press them till they become quite flat. The paper is now ready to be made sensitive. Pictures taken on this paper, for *sharpness* of outline and *minute detail*, are superior to any other.

To render Albumenized Paper sensitive to Light.—The paper, in the state in which it was left by the process just described, is merely glazed with a slight coating of albumen, in which is dissolved a portion of chloride of sodium: in order to make it sensitive, we must convert the chloride of sodium into chloride of silver. This is done by floating the paper upon the following solution,—

Nitrate of Silver	. .	600 gr.	} <i>Dissolve,</i>
Distilled Water	. .	10 oz.	

Pour some of this solution into a gutta-percha or glass dish, and float the paper upon it in the same manner as upon the albumen, allowing it to remain upon the solution about one minute; then hang it up to dry. This operation must be conducted in a room with a yellow blind, or by candlelight.

To Expose the Paper to Light.—The paper is now sensitive to light, and ready to be placed in the pressure-frame, which consists of a frame of wood fitted with a stout plate of glass. On this we place the negative

(either of glass or paper) face upwards; the sensitive surface of the excited paper is now laid upon the negative; and a pad of cloth is next placed over the back of the paper, and then the backboard of the pressure-frame is put on, and screwed down, so as to bring the paper into close contact with the negative. The backboard of the pressure-frame is hinged, which allows the operator to examine the state of the picture by uncovering one side at a time, and carefully separating one-half of the positive paper from the negative. The picture ought to be printed somewhat darker than is eventually required, as the fixing and colouring baths have the effect of slightly reducing it.

To Colour the Picture.—When the picture is printed to the proper depth, remove it from the pressure-frame, and place it in the colouring bath, which is made in the following manner:—

Chloride of Gold	. . . .	10 gr.
Nitrate of Silver	. . . .	60 gr.
Hyposulphite of Soda	. . . .	8 oz.
Water	. . . . .	16 oz.

Dissolve the hyposulphite in 8 oz. of the water, the gold in 6 oz., the silver in the remaining 2 oz. Pour the gold into the hypo, stirring with a glass rod; then add the silver. This order of mixing the solutions must be strictly observed.

On removing the positive print from the pressure-frame, place it in the above solution; it will soon turn from a dark copper colour to a brick red, and gradually

pass through the various shades of brown sepia to a fine purple or black. The time which a print takes to colour depends very much upon the negative: as a rule, the stronger the negative the quicker and better the print will colour. Prints should be frequently moved about while in the colouring bath, and any air-bubbles that may collect on them must be carefully brushed off, as they occasion red spots to appear on the print from the unequal action of the colouring bath. As soon as the print has acquired the desired colour, which it will do in from ten minutes to as many hours, the next proceeding is

To Fix the Picture.—Remove it from the colouring bath, and place it in the fixing bath, made of

Hyposulphite of Soda . . .	3 oz.
Water	16 oz.

Allow it to remain in this bath for five or ten minutes. This latter process is not actually necessary; but it makes the prints whiter and cleaner.

To Wash the Picture.—On removing the print from the fixing bath, place it in a dish of glass or gutta-percha, and wash it under a tap for ten minutes; after which it must be left in water for thirty-six hours, and the water changed at least twelve times. This changing of the water is indispensable, as nine out of ten photographs fade from neglect of it.

The print is now finished.

THE PLAIN-PAPER PROCESS.

The best paper for this process is Toogood's positive and the German positive paper.

To Salt the Paper.—Prepare the following solution:

Chloride of Sodium	200 gr.
Purified Gelatine	30 gr.
Filtered Rain Water	20 oz.

Dissolve the gelatine in 6 oz. of hot water, the chloride of sodium in 14 oz. of cold water, and mix. Pour this solution into a gutta-percha or glass dish, and float the smooth side of the paper upon it for about thirty seconds; then hang it up to dry.

To Excite this Paper.—Take

Nitrate of Silver	600 gr.
Distilled Water	10 oz.

Float the salted side of the paper upon this solution for thirty seconds; then hang it up to dry. It is now ready to be applied in the pressure-frame: colour and fix in the same way as for albumenized paper.

THE AMMONIO-NITRATE PROCESS.

This process was first described by Dr. Alfred Taylor. Its advantages are, that it prints quicker than paper excited with a plain solution of nitrate of silver, and that the black and white tones are more easily attained.

To make Ammonio-Nitrate of Silver.—Take

Nitrate of Silver	. . . .	120 gr.
Distilled Water	. . . .	2 oz.

Dissolve; then add drop by drop strong liquor ammonia, and shake the solution every now and then, until the precipitate, which first falls down, is entirely redissolved. Add a few drops of a 60-grain solution of nitrate of silver; some of the black precipitate will again fall down: add two or three drops of nitric acid, filter it, and it is then ready for use. Be careful to preserve this solution from the light. The best paper for the ammonio-nitrate process is Toogood's positive and the German positive; the Toogood gives very nice brown tints, and the German paper the best black and white,

To Salt the Paper.—Take of

Chloride of Sodium	. . .	20 gr.
Filtered Rain Water	. . .	20 oz.

Immerse the sheets of paper in this solution, then turn them over and take them out one by one, and hang them up to dry.

To Excite the Paper.—Take a flat board rather larger than the paper to be excited, lay a sheet of blotting-paper upon it, and fasten the salted paper to the board by means of two silver pins; now take some of the ammonio-nitrate in a large round brush, and cover the paper with the solution, beginning at the upper left-hand corner, drawing the brush lengthways; then repeat this across the paper. Allow it to remain flat for a few minutes, in order that a sufficient quantity of the solution may be absorbed; then hang up to dry in the usual way. The paper is now ready to be exposed in the pressure-frame: it may then be coloured and fixed in the same way as directed for albumenized paper; or it may be merely fixed in a plain solution of hypo, then washed in the usual way, and the colour given by ironing the print when it is slightly damp with a hot iron; for my own part, I much prefer the use of the gold colouring bath.

THE SEL D'OR PROCESS.

By means of this process the dark purple tones of the French photographers are well produced. It likewise imparts a charming grey tone to the light parts of the positive, and has the advantage of sparing the necessity for over-printing, as the print is not reduced by the action of the colouring bath. The best papers for this process are Canson's, Marion's, or the German positive; with the last the neutral black and white tones, which are so much admired (such as those produced by Mr. Hennah, of Brighton), may be exactly imitated.

To Salt the Paper, take of

Chloride of Ammonium . . .	100 gr.
Purified Gelatine	16 gr.
Water	10 oz.

Dissolve the gelatine first in a small quantity of warm water, and then add it to the solution of ammonium. Float the paper on this solution, allowing it to remain on only until it becomes flat; then hang it up to dry.

Excite the Paper on a 60-grain solution of nitrate of silver, allowing it to remain on the solution about thirty seconds, and then hanging it up to dry.

Expose the Paper in the pressure-frame until the light parts of the picture are printed exactly to the

proper depth: this is of some importance, because, if the light parts of the picture are over-printed, the finished picture will be too dark; bronzing the dark parts is of no consequence.

To Colour the Picture.—On removing the print from the pressure-frame, place it in a dish, and pour over it about a pint of common water, taking care to remove all air-bubbles. Allow it to remain in the water about five minutes, then place it in the following solution:—

Liquor Ammoniaë	1 dr.
Common Water	20 oz.

Keep some of this solution in a bottle ready mixed, as it can be used over and over again as long as it retains any smell of ammonia. Allow the print to remain in the solution until it turns slightly red (about one minute); pour the ammonia back into the bottle, and cover the print again with common water; change the water as often as any milkiness is perceived. All these operations, as well as the subsequent colouring, must be conducted in a yellow, or at least in a diffused light. When the print is sufficiently washed, which may be known by the water ceasing to become milky, immerse it in the colouring bath, made in the following manner:—

Chloride of Gold . . .	8 gr.	} <i>Dissolve.</i>
Distilled Water . . .	16 oz.	
Hyposulphite of Soda .	24 gr.	} <i>Dissolve.</i>
Distilled Water . . .	16 oz.	

Pour the solution of gold into the solution of hyposulphite: this is important.

In from five to fifteen minutes after immersion the print will be coloured. Watch carefully the light parts of the picture; for, if the print is left in the bath too long, they are apt to become yellow, instead of a grey or cream colour. When the right tone is obtained, place the picture in a simple solution of hyposulphite of soda, 3 oz. to the pint of water. Allow it to remain in this solution from five to ten minutes; it may then be washed in the usual way to free it from all traces of hyposulphite. This process at first may seem troublesome, but in practice it is not so; and I am quite certain that, upon plain paper, results are to be obtained in this manner, which for artistic effect are superior to any other. It is particularly adapted for copies of engravings, pen-and-ink drawings, and for portraits.

MR. MAXWELL LYTE'S POSITIVE PROCESS.

The details of this process are taken from a paper read before the Photographic Society, by Mr. Maxwell Lyte, in February last. It seems to possess many good points.

The best paper for this process is Canson's, the German positive, and papier Saxe. Float the paper for about one minute on a solution of

Chloride of Ammonium	20 gr.
Distilled Water	1 oz.

When dry, excite this paper by floating it on a solution of

Nitrate of Silver	8 gr.
Distilled Water	1 oz.

After it has been in contact with this solution for five minutes, hang it up to dry. Print the picture in the usual way; only let it be somewhat darker than will be ultimately required, as the after process tends to reduce it. The print, when taken from the pressure-frame, must now be placed in a dish filled with common water, in order to extract as much as possible of the free nitrate

of silver; then with water in which is dissolved a pinch of common salt; this converts all the remaining nitrate into chloride of silver. Now transfer the print, or prints, to a bath of hyposulphite of soda, made in the following proportions:—

Hyposulphite of Soda	. . . . .	4 oz.
Clean Water	. . . . .	16 oz.
Carbonate of Soda	. . . . .	320 gr.

Here it is to remain until it is fixed, which will be in from fifteen to thirty minutes. It is next to be thoroughly washed in several waters, so as to secure the removal of all the hyposulphite.

The picture will now most probably be of an ugly red colour. After the thorough washing, and whilst it is still wet, place the print in a bath composed of

Aqua Regia	. . . . .	1 oz.
Clean Water	. . . . .	10 oz.

(Aqua regia is made by mixing one part of nitric acid and four of muriatic acid.) Here it will be seen to fade rapidly, and after a short time almost completely to disappear. Now, to get rid of the acid, transfer it to a bath of water, to which a few drops of ammonium have been added. It may then be placed in the following solution:—

Clean Water	1 pint	} <i>To be mixed just before using.</i>
Gallic Acid (a saturated solution in Alcohol)	. . . . .	3 drops
Liquor Potassæ	. . . . .	1 drop

In this mixture the print rapidly darkens, reappearing in all its minutest details; it requires no further treatment than a slight washing in cold water, when it has arrived at its maximum intensity. The bath of gallic acid soon spoils from exposure to the atmosphere; therefore the ingredients should not be put together until the moment when they are required for use. The paper used for this process should not be sized with gelatine, albumen, or any other animal preparation, but with the vegetable preparations used for the machine-made papers manufactured on the Continent.

Lastly, as each paper, while being excited, extracts from the bath a certain amount of nitrate of silver, it becomes necessary to add for each whole sheet (or number of small sheets equalling a whole sheet) which has been sensitized, sixty grains of nitrate of silver, adding at the same time water to make up the quantity of liquid to the original volume:

MR. HARDWICH'S POSITIVE PROCESS WITH CITRATE OF SILVER.

This process is taken from a paper read before the Photographic Society.

Take of

Pure Citric Acid	100 gr.
Chloride of Ammonium . .	100 gr.
Gelatine	10 gr.
Water	10 oz.

The gelatine is used to retain the layer of sensitive salt at the surface of the paper; it does not affect the colour. Dissolve the citric acid in a small portion of water, and exactly neutralise with carbonate of soda; add the soda cautiously, with continual stirring, until the last portions produce no further effervescence, and the immersed litmus paper, previously reddened by acid, begins to change to blue. Take German positive paper, and float the smoothest side on this solution for thirty seconds, then hang up to dry.

To Excite this Paper.—Take of

Nitrate of Silver 1000 gr.

Distilled Water 11 oz.

Float the prepared paper upon this solution for three minutes. When dry it is ready to be exposed in the pressure-frame. When printed to the proper depth, it is to be washed and coloured, and fixed in the same manner as described in the Sel d'Or process. (*See page 15.*)

MR. HARDWICH'S NEGATIVE PRINTING PROCESS UPON NITRATE OF SILVER.

Take

Pure Citric Acid	50 gr.
Chloride of Ammonium . . .	50 gr.
Gelatine	10 gr.
Water	10 oz.

Neutralise the citric acid with carbonate of soda as in the positive process. Papier Saxe or Papier Rive may be employed, floated on the above bath from one minute to a minute and a half. Render sensitive with acetate of silver, 30 grains of nitrate to the ounce of water, with half a drachm of glacial acetic acid; taking the usual precautions against the entrance of white light. The exposure to light, which is very short (three or four minutes in dull weather), is regulated by the colour of the margin of the print on removing the paper; the full outline of the image should be seen, but faint and indistinct. Immersion in bath of gallic acid (3 grains to the ounce of water, diluted to one-half in hot weather), rapidly develops the picture, and in two or three minutes it is fully brought out.

It is of importance to hit the right time of exposure to light, for which take the following directions:—

The under-exposed print developes slowly, becomes *jet black* by continuing the action of the gallic acid, but shows no half tones; the over-exposed, on the other hand, developes with unusual rapidity, and it is necessary to remove it speedily from the bath in order to preserve the clearness of the whites, when washed it appears very red and pale without any depth of shadow. Observe, however, that a certain length of exposure is necessary in this process, and that very few details can be developed which are altogether invisible before the gallic acid is applied. The action of the developer must be stopped at a point when the proof appears somewhat lighter than it is intended to remain; since the use of the gold bath adds a little to the intensity, and the print becomes darker on drying.

Tone with the sel d'or bath as in the positive process. The white parts of the impression will remain pure if the gallic acid be properly washed out, and the toning bath shielded from the action of light. No time, however, must be lost in passing the print from the toning to the fixing bath, or there will be some danger of a decomposition and a yellowness in the lights. From what little experience I have had in negative printing, this appears to me to be the best process in existence. With

a small amount of care any one may obtain very decent prints in a very weak light; but, as a rule, the best developed print is far inferior to a good positive taken in the usual way.

MR. SUTTON'S NEGATIVE PROCESS.

The details of this process are taken from Mr. Sutton's "New Method of Printing Positive Photographs." The only advantage I can see in it is, that it enables the operator to print in a light insufficient for carrying on any of the other processes, except that immediately preceding.

Mr. Sutton's process involves the following six operations, viz.:—

1. To prepare the paper with serum of milk.
2. To render it sensitive.
3. To expose it in the pressure-frame.
4. To develop the picture.
5. To colour with sel d'or.
6. To fix it and remove by washing the redundant chemicals.

To Prepare the Paper.—This is very simple. Immerse each paper separately in a bath containing serum of milk. The serum is prepared thus:—Curdle some fresh milk by means of a piece of rennet; filter it through muslin to separate the curd; then boil it in an earthen pipkin. Filter again through muslin, and afterwards through blotting-paper. The piece of rennet, if

salted, must be washed in order to remove the salt. The best paper for this process is Canson's, thick or thin; papier Rive, or Marion's; or the German positive.

To render the Paper Sensitive.—Immerse the papers entirely in a bath of aceto-nitrate of silver, using a bent glass rod to remove air-bubbles. The strength of the bath will vary with the paper employed and the negative to be printed. When the negative is somewhat feeble, employ a weak solution,—15 grains of nitrate of silver and $\frac{1}{2}$ drachm of acetic acid to each ounce of distilled water. But with a strong negative, use 30 grains of nitrate of silver and $\frac{1}{2}$ drachm of acetic acid to the ounce of distilled water. Let the paper remain for two or three minutes in the bath, then hang it up to dry in a yellow light. White light must be carefully excluded. The sensitive papers must be used as soon as possible after they are excited. Before using the nitrate bath it should be carefully filtered. The strength of the bath is not diminished by use, and it can be employed to the last drop.

To Expose to Light.—Place the paper in the pressure-frame in the dark room, cover the front with a dark cloth, and convey it to the light. Place it in full sunshine, if possible, but ordinary daylight will do; it is merely a question of time. When all is ready, remove the dark cloth, and watch the outside border of the paper; experience alone will determine the tint which the border ought to assume before the exposure should be stopped. This will vary with different negatives, so

that to fix any definite time would only be to mislead. The time of exposure will vary from twenty seconds to as many minutes; but in twenty minutes a print might be obtained when it would be impossible to print at all by the ordinary method. The picture ought to be faintly visible on removal from the frame. An over-exposed print will present, when finished, the same appearance as a sun-print under similar circumstances,—that is, it will be too black. On the other hand, an under-exposed picture will be too faint. The pressure-frame need not be hinged at the back.

To Develope the Picture.—Remove the pressure-frame into the dark room; take out the print and place it in a saturated solution of gallic acid, previously filtered; remove all air-bubbles from the surface of the print by means of a bent glass rod: two or three prints may be put into the same bath. The development will generally occupy about five minutes. It is scarcely necessary to remind the reader that white light, unless carefully excluded, will leave traces of its presence, or that the same precautions must be observed as in taking a negative by the collodion process. With clever manipulation the white parts of the picture need never become dirty; this can only happen through carelessness. When the picture is sufficiently developed, remove it from the gallic acid and wash it well in common water, afterwards with a pinch of salt in the water, then again in water copiously. The colour of the dark parts of the picture will now be of a dark reddish brown. The

developed print loses nothing by the subsequent action of the colouring and fixing bath.

To Colour the Picture.—This is a very simple process, and may be conducted in a half-light, near a door ajar, or at a north window with the blind down: there being little or no chloride in the print, it is now nearly fixed. To make the colouring bath, take—

Chloride of Gold . . .	8 gr.	} <i>Dissolve.</i>
Distilled Water . . .	16 oz.	
Hyposulphite of Soda . .	24 gr.	} <i>Dissolve.</i>
Distilled Water . . .	16 oz.	

Pour the gold solution into the hyposulphite (this is very important), and mix them well together. Then pour as much of the solution into a gutta-percha dish as you require for one print. Immerse the print completely and keep it moving about; watch the changes of colour which it undergoes: in the course of five or ten minutes it will pass through every shade of brown to black. Stop the process at whatever tint you like best, by removing the print, and placing it in a bath of clean water. But, above all things, observe carefully the change which takes place in the light parts of the print, and do not let the action go too far, or these will become yellow. Do not omit to wash the print well before placing it in the colouring bath, or there will be a considerable precipitation of the gold. The bath may be used over and over again, until it gets too weak to colour well, then throw it away.

To Fix and Wash the Picture.—Make a fresh bath of

Hyposulphite of Soda . . . 1 oz.

Filtered Water 10 oz.

and let the print lie in it for not less than ten minutes. Every trace of hyposulphite should then be removed, by washing for twenty-four, or even thirty-six hours, in an abundance of water, which must be changed at least a dozen times.

A FEW REMARKS
ON THE
FADING OF PAPER POSITIVES,
AND ON THE
MEANS OF THEIR PRESERVATION.

In the first place, be very careful always to wash your pictures well; *in running* water if possible. If the slightest trace of the hyposulphite of soda be left in the picture it will be almost certain to fade. I say *almost* certain, because, in one or two cases, positives that have been very imperfectly washed have remained good for years. As a general rule, however, the presence of hyposulphite will cause the positive, first to turn yellow, then gradually to fade away. I believe this to be the most general cause of fading; at the same time the recent investigations of Mr. Hardwich and the Printing Committee, and the startling disclosures made by Mr. Malone, place before us the disagreeable fact that, unless protected in some way or other, photographs

on plain paper (and most likely those on albumenized paper likewise) will in time *fade*, from the mere action of the oxygen in the atmosphere. If this is the case (and I fear there is little doubt of it), we must seek a protection for our prints in some kind of varnish which shall render them impervious to the action of the atmosphere. Varnish, however, necessitates a great deal of trouble. The process to which I called attention in a letter to the "Photographic Journal" for April 1855, and which has, I believe, been made use of for some time at Rome, will, I think, tend greatly to the preservation of photographic pictures. Take equal parts of melted white wax and common turpentine; when cool, the mixture will have the consistency of pomade. Apply this with a stiff paint-brush to the positive print; rub it in with a piece of flannel; hang it up in a warm room for six or twelve hours; then brush it with a hand-brush to polish it. The smell of the turpentine will go off in a few days. I have for some months adopted this process, both for plain and albumenized paper. It improves the appearance of the prints, and all the evidence I can collect is confirmatory of my own opinion of its merits.

Mr. Hardwich's experiments tend to show that albumenized paper, with proper care in the washing, is likely to be the most permanent; it is, therefore, the best for general use. At the same time I believe that plain paper is just as permanent, if fixed in some form of gold bath, and protected from the action of the oxygen of

the atmosphere, either by the means just described, or by some kind of varnish.

A word as to the mounting of photographs. The worst material we can use is paste; it is sure to turn acid, and destroy the print. Gum arabic is better; but the best and nicest material is gelatine, in the form of thin glue, used warm and fresh made. White of egg also is an excellent material for mounting photographs.

MESSRS. CUNDALL AND HOWLETT,

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